Water Quality Classification Assessment

Rivers and Streams in the Bay of Plenty

Bay of Plenty Regional Council
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Cover Photo: The Bay of Plenty Rivers

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Executive Summary

Water quality classifications are included in regional plans as a guide for issuing resource consents for discharges to water or to land where water may be affected. They may also be used for administering permitted activities under regional plans or the Resource Management Act (RMA). Effectively these classifications provide a 'bottom line' below which water quality should not fall and against which the effects of discretionary (consented) activities can be regulated.

The purpose of this report is to assess the water quality of streams and rivers in the Bay of Plenty against the 'Water Quality Classification Standards and Criteria' given in Schedule 9 of the Regional Water and Land Plan (the 'RWLP'). The assessment is based on standard physical and chemical water quality parameters (e.g. temperature, pH, dissolved oxygen), macro-nutrients (nitrogen and phosphorus) and indicator bacteria (*E.coli* and faecal coliforms).

The findings of this assessment may be used to assist in setting contaminant limits for resource consents and to identify priority catchments for management intervention. They may also be used to review the appropriateness of water quality classifications for streams and rivers as per Method 80 of the RWLP.

The assessment shows that almost all monitored sites meet the relevant classification standards and criteria for pH, temperature, dissolved oxygen, and turbidity. The standards for these parameters are based on the needs of aquatic life (particularly fish, invertebrates and aquatic plants) and the results show that most rivers and streams in the Bay of Plenty are able to support healthy aquatic ecosystems.

Just over half of the rivers and streams monitored have nutrient levels which could lead to undesirable growths of algae and/or macrophytes (aquatic plants). However, only one river has occurrences of one of the three biological growths nominated in Schedule 9 of the RWLP. Undesirable blue-green algae mats are present in some Eastern Bay of Plenty rivers although no specific cause for these growths has been determined.

Overall, the assessment shows that just nine of the 50 river and stream sites examined meet all of the RWLP classification standards and criteria for water quality at all times. The single biggest contributor to this situation is bacterial quality as many of the sites fail to meet the bacterial indicator standards for stock drinking water and recreation. However, it is important to note that these standards have been interpreted at 'face value'. The presence of indicator bacteria (in this case *E.coli* and faecal coliforms) does not mean that pathogens (disease causing organisms) are present but rather that there is an increased risk that they are present. Better measurement tools are being progressively developed for a number of water-borne pathogens (including viruses, *Giardia* and *Cryptosporidium*) to provide a more direct link between water quality and health risk.

In conclusion, the findings of this assessment suggest that while water quality classifications provide a useful management framework, better tools are needed to manage the cumulative effects of activities that degrade water quality, in particular those from land-use practices. These may include the setting of catchment based contaminant limits in priority areas as has occurred in some of the Rotorua Lakes.

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Part 1: Introduction

Water quality classifications are included in regional plans as a guide for issuing resource consents for discharges to water or to land where water may be affected. They may also be used for administering permitted activities under regional plans or the Resource Management Act (RMA). Effectively these classifications provide a 'bottom line' below which water quality should not fall and against which the effects of discretionary (consented) activities can be regulated[1].

The Bay of Plenty Regional Water and Land Plan (the 'RWLP') is the document where policies and rules relating to the use of fresh water are given statutory effect. Activities that involve the abstraction of water or the discharge of contaminants to water require resource consent, unless a rule in a regional plan (or a national environmental standard/regulation) permits such activities. The abstraction of water for domestic and stock drinking is expressly permitted under section 14 of the RMA and there are a number of other provisions in the Act that relate specifically to water.

Under Section 69 of the RMA regional councils are able to set rules for water bodies based on the 'Water quality classes' given in Schedule 3 of the Act. Where a council considers that these classes are not adequate or appropriate, new classes and standards may be stated in a regional plan. This is the approach that the Bay of Plenty Regional Council has taken in developing its own water quality classifications in the RWLP and the Regional Plan for the Tarawera River Catchment.

The purpose of this report is to assess the water quality of streams and rivers in the Bay of Plenty against the 'Water Quality Classification Standards and Criteria' given in Schedule 9 of the Regional Water and Land Plan[2]. The assessment is based on standard physical and chemical water quality parameters that are designed to maintain ecological integrity and/or protect the aesthetic, cultural and recreational values of rivers and streams.

[1] Note: the standards listed for each class apply after reasonable mixing of any contaminant or water with the receiving water and disregard the effect of any natural perturbations that may affect the water body.

[2] Performance against the classification standards in the Regional Plan for the Tarawera River Catchment is discussed briefly where relevant.

Part 2: Classification Standards and Criteria

2.1 Introduction

The water quality classification standards and criteria for rivers and streams in the Bay of Plenty are given in the Regional Water and Land Plan (the 'RWLP') and the Regional Plan for the Tarawera River Catchment (see Table 2.1 below and Table 2.2). Each classification is based on standard physical and chemical water quality parameters (e.g. pH, dissolved oxygen), macro-nutrients (nitrogen and phosphorus) and indicator bacteria (*E.coli* and faecal coliforms).

Under the RWLP, river and stream systems are assigned to a particular classification (or classifications) depending on their predominant use or value. For example, streams and rivers classified under 'Natural State' have a level of protection such that no discharge is allowed to "alter the natural quality of the water" while others allow slightly lower standards for some parameters (e.g. 'Contact Recreation' has a lower standard for water clarity).

It is important to note that different classifications can apply to different reaches of the same waterway; for example the upper reaches of the Whakatane River are classified as 'Aquatic Ecosystem' while the lower reaches have a less stringent classification, 'Water Supply'.

Table 2.1 Water quality standards and criteria as per the Regional Water and Land Plan (Schedule 9).

Quality Standard	**Natural State (NS)**	**Aquatic Ecosystem (AE)**	**Contact Recreation (CR)**	**Water Supply (WS)**	**Modified with Ecological values (MWEV)**	**Regional Baseline (RB)**
Temperature, pH, SS	No increase in Temperature or SS. No change in pH			6.0 > pH < 9.0	Temperature < 18 ºC	
Bacterial quality	*E.coli* < 126 cfu/100ml	*E.coli* < 126 cfu/100ml	*E.coli* < 126 cfu/100ml	*E.coli* < 126 cfu/100ml	*E.coli* < 126 cfu/100ml	*E.coli* < 410 cfu/100ml
Undesirable biological growths		Shall not increase	Shall not increase	Shall not increase	Shall not increase	Shall not increase
Water clarity	0% decrease	<10% decrease	< 1.6 black disk	<20% decrease	<20% decrease	<20% decrease
Dissolved oxygen	No decrease	DO > 80%		DO > 5g/m^3		DO > 80%
*Farm animal consumption**	Median FC < 100cfu/100ml	Median FC < 100cfu/100ml	Median FC < 100cfu/100ml	Median FC < 100cfu/100ml	Median FC < 100cfu/100ml	Median FC < 100cfu/100ml
Aquatic life	ANZECC (2000)	ANZECC (2000)	ANZECC (2000)	ANZECC (2000)	ANZECC (2000)	ANZECC (2000)

* FC = faecal coliforms, SS = suspended solids

Table 2.2 Water quality standards and criteria as per the Regional Plan for the Tarawera River Catchment (Rules in Chapter 15: Surface Water Quality).

Quality Standard	**Fish spawning – Upper Tarawera (FSUT)**	**Fish purposes – Lower Tarawera (FPLT)**
Dissolved oxygen	DO > 80%	DO > 4.5g/m^3 (7 & 30 day limits also)
Water clarity/ colour	Black disk - 0% decrease	Colour - 0.8 abs at 440nm/cm
Temperature	Temperature < 25 ºC	Temperature < 25 ºC
pH	pH , > 6.5, < 8.5	pH , > 6.5, < 8.5
Undesirable biological growths	Periphyton < 40% bed cover, &/or 100mg chl-a/m^2	Periphyton < 40% bed cover, &/or 100mg chl-a/m^2
Farm animal consumption		Median FC < 100cfu/100ml

2.2 Interpretation of quality standards

The water quality criteria are expressed in a number of ways; in narrative form (e.g. “no increase in temperature”), as absolute values that are not to be exceeded (e.g. “Temperature < 25 ºC”) and by reference to established guidelines (e.g. ANZECC 2000). This can lead to differences in the way the standards are interpreted and applied and for this reason the parameters that are ‘problematic’ are discussed in more detail below.

2.2.1 Undesirable biological growths

The concentrations of nitrogen and phosphorus in water give an indication of the potential for undesirable biological growths. Excessive concentrations of these nutrients can lead to prolific growths of periphyton (attached algae), phytoplankton (free-living algae) and macrophytes (attached aquatic plants). Whether nuisance growths occur in the presence of elevated nutrients is dependant on site specific conditions. For example, streams and rivers with high flushing flows, or sandy beds with high bed-load movement, may not be susceptible.

While monitoring of undesirable biological growths occurs at a number of sites in the Bay of Plenty (in response to past issues) there is no region wide monitoring programme for these growths. For the purpose of this assessment nutrient concentrations have been compared against the periphyton guidelines of Biggs (2000) to give some indication of the potential for growths to occur. These guidelines were used in a recent Ministry for the Environment report on the effects of dairy farming on water quality (MfE 2009). The MfE report used the following threshold guidelines for the control of periphyton growth; 0.295 g/m^3 for dissolved inorganic nitrogen (DIN) and 0.026 g/m^3 for dissolved reactive phosphorus (DRP). These guidelines relate to a 20-day mean accrual of nutrient based on the time taken for periphyton to accrue nutrients before scour or loss due to high flow events.

The ANZECC Guidelines also have trigger values for nitrogen and phosphorus based on the 80th percentile of lowland river reference data. The trigger values are; 0.614 g/m^3 for total nitrogen (TN); 0.444 g/m^3 for oxides of nitrogen (NOx-N), 0.033 g/m^3 for total phosphorus (TP) and 0.01 g/m^3 for DRP.

The nutrient guidelines from Biggs and ANZECC could be considered conservative for moderately degraded river systems. However, in the absence of periphyton growth data or updated data on moderately degraded river systems these guidelines

have been used here to put the Bay of Plenty river nutrient data into the context of the water quality classifications.

2.2.2 Aquatic life protection

The ANZECC (2000) guidelines have been used to assess the potential for impacts on aquatic life using the parameters that are available. These are ammonium nitrogen (trigger value of 0.9 g/m^3 at pH 8 and 20ºC) and turbidity (trigger value of 5.6 NTU).

2.2.3 Bacteria

The indicator bacteria guidelines used here are based on *E.coli* for recreational water quality (MfE 2003) and faecal coliforms for stock drinking water (ANZECC 2000). These bacteria occur naturally in the gut of humans and animals, including mammals, birds, fish and reptiles. It is important to note that these indicator bacteria themselves do not pose a significant risk to human health. Rather, they indicate the presence of faecal material, which contains disease-causing pathogens. It is the number of faecal coliforms or *E.coli* per 100 mL of water that is measured and on which the guideline levels are based.

A bacterial standard of 126 *E.coli*/100 ml is included in most of the RWLP water classifications to protect human health. This value was based on the single sample limit of the bathing quality guideline when the plan was written. This national standard was later revised to 550 *E.coli*/100 ml (red alert mode, 260 *E.coli*/100ml for orange alert mode). For the purposes of this assessment, the classification standard is assumed to be met if bacterial levels are less than 550 *E.coli*/100 ml.

The bacterial standard used for stock drinking water is 100 faecal coliforms/100ml (median value, ANZECC 2000). The levels of faecal coliforms in water closely match that of *E.coli* as these are part of the group of faecal coliforms.

Part 3: Classification Assessment

3.1 Overview

This assessment is based on regional monitoring data collected from July 2007 to June 2009 (see Scholes 2009). For some river and stream sites the data set is shorter as monitoring is undertaken less frequently.

Performance against the relevant classification standards and criteria is shown in Tables 3.1 to 3.4. The following notes will assist in interpreting the tables;

- The column headed '*E.coli* % below' gives the percentage of the data that is below (meets) the standards of 126 and 550 *E.coli*/100ml respectively.
- Performance against the 'Physical' and 'Stock water' standards is shown as green (■), indicating that the classification standards have been met, or red (■) indicating that the standards have not been met.
- The 'Nutrient levels for UBG' column indicates the potential for undesirable biological growths (UBG's) based on nutrient levels. Where UBG's have actually been recorded this is noted. Where nutrient levels are exceeded but no UBG's have been observed an orange square (■) is shown.
- Shaded sites indicate that all of the classification standards and criteria have been met on all sampling occasions as assessed using the methods described in this report.

For ease of comparison the sites are discussed below in broad geographical groupings.

3.2 Eastern and Whakatane sites

Four of the 11 sites assessed met the RWLP classification standards and criteria (Table 3.1). Water quality at the Eastern and Whakatane sites is generally good with the physical parameters and nutrient levels meeting the criteria for all but the Nukuhou Stream. Overall performance is reduced due to elevated bacterial levels.

Table 3.1 Eastern and Whakatane river sites assessed against the water quality classification standards and criteria

Eastern and Whakatane Sites	Classification	*E coli* % below		Stock water	Physical	Nutrient levels for UBG*
		126	550			
Whangaparaoa at SH 35	AE	75	92	■	■	■
Raukokore atSH 35	AE	92	100	■	■	■
Haparapara at SH 35	AE	100	100	■	■	■
Motu at Waitangirua	NS	33	79	■	■	■
Motu at SH 35	NS	88	96	■	■	■
Otara at Browns Bridge	AE	92	100	■	■	■
Waioeka at Pa	CR	82	95	■	■	■
Nukuhou at Old Quarry	AE	9	50	■	■	■
Waimana at Taneatua	WS	83	92	■	■	■
Whakatane at Ruatoki	AE	92	100	■	■	■
Whakatane at Pekatahi	WS	69	94	■	■	■^

* UBG = undesirable biological growths.
^ observed UBG.

The poor quality of the Nukuhou Stream is notable is it does not meet any of the standards and criteria. Turbidity is higher than other streams in the area as the stream cuts through a flood plain and bank erosion adds to the sediment load. Nitrogen levels are elevated but known to be decreasing as remedial works in the catchment take effect. Bacterial contamination is also high with only 50% of the samples under the red alert level (550 *E.coli*/100 ml) for bathing quality.

3.3 Rangitaiki and Tarawera sites

One of the eight sites assessed met the RWLP classification standards and criteria (Table 3.2). The presence of elevated nutrient levels and undesirable biological growths in the Rangitāiki River along with elevated bacterial levels contributed most to this.

Table 3.2 Rangitaiki and Tarawera sites assessed against water quality classification standards and criteria

Rangitaiki and Tarawera Sites	Classification	*E coli* % below		Stock water	Physical	Nutrient levels for UBG*
		126	550			
Whirinaki at Galatea Bridge	AE	96	96	■	■	■
Rangitaiki at Murupara	AE	96	96	■	■	■^
Rangitaiki at Aniwhenua	AE	100	100	■	■	■^
Rangitaiki at Matahina	AE	73	91	■	■	■^
Rangitaiki at Te Teko	AE	88	100	■	■	■^
Tarawera at Lake Outlet	FSUT	100	100	■	■	■
Tarawera at Kawerau	FSUT	70	95	■	■	■
Tarawera at Awakaponga	FSLT	79	96	■	■	■

* UBG = undesirable biological growths.
^ observed UBG.

An increase in nitrogen levels in the Rangitaiki River at Murupara is thought to be due to activities in the upper catchment. Extensive development of dairying around the Napier/Taupo highway may have increased nitrate losses to groundwater in this area. Dilution from the Whirinaki, Horomanga and other rivers reduces nitrogen levels downstream of Murupara. Despite the nitrogen levels aquatic ecosystems are in good health. There has been a long standing issue of aquatic plant growth in the canal of the Wheao power scheme but this preceded the development of dairying upstream. Mats of *Phormidium*, an attached filamentous blue-green algae, occur from Murupara to Edgecumbe and are particularly prevalent during summer low-flow conditions (see Scholes, 2010).

River colour in the lower Tarawera River at Awakaponga exceeds the classification in the Regional Plan for the Tarawera River Catchment due to wastewater discharges from the pulp and paper mills at Kawerau. Faecal coliform levels are also higher than the guideline for stock water.

3.4 Western and Rotorua sites

Four of the 12 sites met the RWLP classification standards and criteria (Table 3.3). Again, the major factor contributing to this was bacterial quality. Many of these sites have varying intensities of livestock agriculture as the predominant land use within their catchments.

Table 3.3 Western and Rotorua river and stream sites assessed against water quality classification standards and criteria

Western and Rotorua Sites	Classification	*E coli* % below		Stock water	Physical	Nutrient levels for UBG*
		126	550			
Ngongotaha at Town Bridge	AE	33	90	■	■	■
Puarenga at Scion	AE	55	75	■	■#	■
Ohau at SH 33	AE	91	100	■	■	■
Okere at Control Gates	AE	95	100	■	■	■
Kaituna at Te Matai	CR	63	89	■	■	■
Kaituna at Paengaroa	AE	92	100	■	■	■
Pongakawa at SH 2@	MWEV	50	100	■	■	■
Pongakawa Old Coach Rd@	AE	75	100	■	■	■
Pongakawa at Forest@	AE	100	100	■	■	■
Pikowai Stream at SH 2@	AE	50	83	■	■	■
Mimiha Stream at SH 2@	AE	40	60	■	■	■
Waitahanui Stream at SH 2@	AE	25	92	■	■	■

* UBG = undesirable biological growths.
# The Puarenga has a high natural turbidity at this location due to geothermal inputs.
@ Data period is July 2009 to June 2010 .

Nitrogen and phosphorus levels are also elevated at many of these sites compared to the ANZECC guideline. This is due to the high rate of nitrate leaching in pumice soils and phosphorus leached from the underlying pumice geology. The overriding value given to each river in the classification is not compromised in any case as these sites generally do not support undesirable biological growths due to their mobile sandy beds.

3.5 Tauranga sites

None of the 19 sites assessed met the RWLP classification standards and criteria (Table 3.4). This is almost entirely due to elevated bacterial levels.

The Kopurererua, Te Mania, Wainui, and Rocky Streams have slightly higher turbidity than guidelines for the protection of aquatic life. Nitrogen and phosphorus are also elevated. Increased turbidity and phosphorus levels may be a result of the geology and river morphology.

Table 3.4 Tauranga river and stream sites assessed against water quality classification standards and criteria

Tauranga Sites	Classification	*E coli* % below		Stock water	Physical	Nutrient levels for UBG*
		126	550			
Waitao at Spencer Farm	AE	0	45	■	■	■
Waimapu at Pukemapui Rd	AE	14	64	■	■	■
Waimapu at Greerton Park	CR	0	68	■	■	■
Wairoa below Power Station	AE	36	64	■	■	■
Wairoa at SH 2	AE	40	85	- #	■	■
Ngamuwahine at SH 29	AE	27	73	■	■	■
Omanawa at SH 29	AE	22	87	■	■	■
Waipapa at Old Highway	CR	20	50	■	■	■
Tuapiro at Surtees Rd	AE	27	91	■	■	■
Kopurererua at SH 2	AE	26	78	■	■	■
Kopurererua at SH 29	AE	18	68	■	■	■
Te Mania Stream at SH 2	AE	4	65	■	■	■
Wainui at SH 2	AE	38	72	■	■	■
Waitekohe at SH 2	AE	27	82	■	■	■
Waiau at Waiau Rd Ford	AE	22	78	■	■	■
Te Rereatukahia Str at SH 2	AE	18	73	■	■	■
Aongatete at SH 2	AE	45	91	■	■	■
Rocky Str at Mangatawa Lane	RB	8	64	■	■	■
Uretara at Henry Rd	AE	30	90	■	■	■

UBG = undesirable biological growths.
# The Wairoa River at SH2 has saltwater influence and therefore is not analysed for faecal coliforms.

Thirteen of the Tauranga sites met the recreational bathing guideline of 550 *E.coli*/100 ml less than 80% of the time. All but one site exceeded the median faecal coliform standard of 100 cfu/100ml for stock water. Despite this, the microbiological water quality standards for recreation are rarely exceeded in Tauranga Harbour, although contamination of shellfish can occur (see Scholes *et al*., 2009).

In general the Tauranga streams show an increasing median bacterial concentration with increasing pastoral land in the catchment. Many of these streams are also relatively small (with the exception of the Wairoa River) and therefore have low levels of dilution.

Part 4: Conclusions

Managing waterways to meet their water quality classifications has historically been achieved by regulation through the resource consent process. This has addressed many of the water quality issues related to point-source discharges, either by moving to land disposal or by setting progressively lower contaminant discharge limits With land-use change and intensification the ability of resource consents to manage performance against classification has been reduced. The classification system remains a useful framework for water quality management but it is less able to effectively control the 'non-regulated' land-use practices that lead to diffuse source discharges. It is these diffuse sources that are now having the greatest effect on the quality of water in rivers and streams in the Bay of Plenty.

The assessment undertaken in this report provides information only on the range of contaminants and parameters given in the Schedule 9 classifications. Other contaminants such as pesticides, heavy metals, and hydrocarbons are generally regulated on a case by case basis through resource consent conditions or as part of focused investigations. A further weakness of the current classification system is that it does not address ecological integrity other than to consider undesirable biological growths.

The assessment shows that almost all monitored sites meet the relevant classification standards and criteria for pH, temperature, dissolved oxygen, and turbidity. The standards for these parameters are based on the needs of aquatic life (particularly fish, invertebrates and aquatic plants) and the results show that most rivers and streams in the Bay of Plenty are able to support healthy aquatic ecosystems. The exceptions are for turbidity in the Nukuhou River and the Puarenga Stream, the latter being influenced by geothermal inputs.

Just over half the rivers and streams monitored have nutrient levels which could lead to increases in undesirable biological growths should environmental conditions be favourable (e.g. bed stability, light, temperature). The water quality classifications in the RWLP refer to only three indicator organisms to assess for undesirable biological growths (genus *Sphaerotilus* or sewage fungus, *Zoogloea*, and *Beggiatoa*). *Sphaerotilus* has been observed in the lower Rangitaiki River and is associated with lactose discharges from the dairy factory. Otherwise these species are not present at nuisance levels in rivers and streams in the Bay of Plenty.

More recently the benthic cyanobacteria (blue green algae) *Phormidium* spp. has been observed widely in the Rangitaiki River and other Eastern Bay of Plenty rivers, but has not been associated with any specific discharges. Increasing nutrient loads may not be the primary cause of nuisance periphyton or macrophyte growth as factors such as temperature, flow, bed composition and riparian margins can also be important. Hence, it can be a complex task to ascertain the impacts of nutrients on streams and rivers and this can be site or catchment specific, particularly since nutrient contamination is predominantly from non-point sources.

Overall, just nine of the 50 river and stream sites examined meet all of the classification standards and criteria at all times. The single biggest contributor to this situation is bacterial quality as many of the sites fail to meet the bacterial standards for stock drinking water and recreation. However, it is important to note that these standards have been interpreted at 'face value'. The presence of indicator bacteria (in this case *E.coli* and faecal coliforms) does not mean that pathogens (disease causing organisms) are present but rather that there is an increased risk that they are present. Better measurement tools are being progressively developed for a number of water-borne pathogens (including viruses, *Giardia* and *Cryptosporidium*) to provide a more direct link between water quality and health risk.

It should also be noted that the stock drinking water standard of 100 faecal coliform colonies per 100 ml is conservative. Much bacterial contamination comes from farmed animals so pathogens are likely to be most specific to farm animals. ANZECC (2000) recommend that investigations occur into stock water drinking supplies once 20 percent of samples exceed 400 faecal coliform colonies per 100 ml. Median results from the Tauranga streams over the period assessed in this report show that the Waitao, Waimapu, Waipapa, Waiau, and Rocky Streams are above this threshold (at least 50 percent of samples exceed 400 colonies per 100 ml). Further work is necessary to better understand the importance of this issue.

In Rotorua streams, although nutrient levels may meet classification standards or may have little measurable impact on the stream, there can still be an impact on lakes. Lakes have a theoretical maximum nutrient load (set as a specific Trophic Level Index value in the RWLP) that effectively governs the nutrient load of inflows including streams, springs and groundwater.

In conclusion, the findings of this assessment suggest that while water quality classifications provide a useful management framework, better tools are needed to manage the cumulative effects of activities that degrade water quality, in particular those from land-use practices. These may include the setting of catchment based contaminant limits in priority areas as has occurred in some of the Rotorua Lakes.

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Appendices

Appendix 1

Table A.1 NERMN River Sites and Water Quality Classifications.

Area	Rivers	Description	Site No	Grid No.	Classification
Western/ Rotorua	Ngongotaha	Town Bridge	BOP110013	U15:9190-4170	Aquatic ecosystem
	Puarenga	FRI	BOP110058	U16:9620-3340	Aquatic ecosystem
	Ohau	SH 33 Bridge	BOP110025	U15:0250-4560	Aquatic ecosystem
	Rotoiti o/lt	Control Gate	BOP110026	U15:0380-4850	Aquatic ecosystem
	Kaituna	Te Matai Rail Bridge	BOP110028	U14:0610-7365	Contact recreation
	Kaituna	Maungarangi Rd Br	BOP110027	U15:0860-6820	Aquatic ecosystem
	Pongakawa	SH 2 Bridge	BOP110030	V15:1943-7020	MWCEV
	Pongakawa	U/S Site (Old Coach)	BOP110112	V15:1860-6620	Aquatic ecosystem
	Pongakawa	Johnston Rd (Forest)	BOP110118	V15:1780-6070	Aquatic ecosystem
	Pikowai Stream	SH 2	BOP110115	V15:3240-6530	Aquatic ecosystem
	Mimiha Stream	SH 2	BOP110117	V15:3530-6390	Aquatic ecosystem
	Waitahanui Stream	SH2 Bridge	BOP110095	V15:2660-6790	Aquatic ecosystem
Tauranga Harbour	Waitao	Spensers farm	BOP710004	U14:9480-8150	Aquatic ecosystem
	Waimapu	Pukemapui Road	BOP160212	U14:8730-7870	Aquatic ecosystem
	Waimapu	Greerton Park	BOP160121	U14:8710-8000	Contact recreation
	Wairoa	d/s Powerstation	BOP110088	U14:7960-7680	Aquatic ecosystem
	Wairoa lwr	S.H 2 Bridge	BOP110034	U14:8310-8460	Aquatic ecosystem
	Ngamuwahine	Old Ngamuwahine Br.	BOP110035	U14:7560-7170	Aquatic ecosystem
	Omanawa	S.H 29 Bridge	BOP110036	U14:8080-7780	Aquatic ecosystem
	Waipapa	Old Highway Bridge	BOP710011	U14:7490-8900	Contact recreation
	Tuapiro	Surtees Rd.	BOP710003	T13:6840-0740	Aquatic ecosystem
	Kopurererua	S.H.2	BOP710009	U14:8810-8450	Aquatic ecosystem
	Kopurererua	S.H.29-Rec. house	BOP710008	U14:8420-8060	Aquatic ecosystem
	Te Mania Strm	S.H 2 bridge	BOP710022	T14:6730-9780	Aquatic ecosystem
	Wainui	S.H 2 bridge	BOP710027	U14:7130-9220	Aquatic ecosystem
	Waitekohe	S.H 2 bridge	BOP710023	T14:6770-9610	Aquatic ecosystem
	Waiau	Waiau Road Ford	BOP710040	T13:6990-1290	Aquatic ecosystem
	Te Rereatukahia Stream	SH2	BOP710025	T14:6460-9760	Aquatic ecosystem
	Aongatete	S.H 2 bridge	BOP710028	T14:6990-9520	Aquatic ecosystem
	Rocky Strm	Mangatawa Lane	BOP710032	U14:9660-8440	Regional baseline
	Uretara	Henry Rd. crossing	BOP210004	T13:6750-0092	Aquatic ecosystem

Area	Rivers	Description	Site No	Grid No.	Classification
Eastern	Whangaparaoa	S.H.35 Bridge	BOP110001	Y14:5340-9070	Aquatic ecosystem
	Raukokore	S.H.35 Bridge	BOP110002	Y14:3995-8045	Aquatic ecosystem
	Haparapara	SH35 Bridge	BOP160100	X15:2130-6740	Aquatic ecosystem
	Motu*	S.H.35 Bridge	BOP110003	X15:1760-6050	Natural state
	Motu*	Waitangirua	BOP110093	X16:1310-1825	Natural state
	Otara	Brown's Bridge	BOP110005	X16:9290-3780	Contact Recreation
	Waioeka	Pa Site	BOP160102	W16:8580-3660	Contact Recreation
	Nukuhou	Old Quarry	BOP110007	W16:7290-3870	Aquatic ecosystem
Whakatane	Waimana	Taneatua Bridge	BOP110009	W16:7290-3870	Water supply
	Whakatane	Ruatoki Bridge	BOP110010	W16:6080-3240	Aquatic ecosystem
	Whakatane	Pekatahi Bridge	BOP110011	W15:5970-4270	Water supply
Rangitaiki	Whirinaki*	Galatea Bridge	BOP110014	V17:3700-9590	Aquatic ecosystem
	Rangitaiki*	Old Bridge at Murupara	BOP110015	V17:3270-9830	Aquatic ecosystem
	Rangitaiki	Inlet to Canal	BOP110016	V16:4160-1460	Aquatic ecosystem
	Rangitaiki*	Te Teko Bridge	BOP110018	V15:4360-4480	Aquatic ecosystem
	Rangitaiki	Matahina Dam	BOP110082	V16:4440-3600	Aquatic ecosystem
Tarawera	Tarawera*	Lake Outlet	BOP110020	V16:1670-2950	Fish purposes UTR
	Tarawera	Boyce Park	BOP110021	V15:3570-4040	Fish purposes UTR
	Tarawera*	Awakaponga	BOP110052	V15:4120-5530	Fish purposes LTR

*NIWA co-monitored site.